WHAT IS CLAIMED:

1. An endeffector for handling semiconductor wafers comprising:

a base member having a proximal end and a distal end, the base member having a top surface configured to receive a semiconductor wafer;

a plurality of support members located on the top surface of the base member, the plurality of support members being configured to contact a wafer received on the top surface;

a pushing device for positioning a wafer on the base member, the pushing device comprising a retractable piston configured to contact an edge of a semiconductor wafer, the piston being movable between an extended position and a retracted position;

a biasing member placed in association with the piston, the biasing member biasing the piston towards its retracted position; and

a pneumatic actuator in operative association with the piston, the pneumatic actuator being configured to receive a pressurized gas that is used to overcome a force being applied to the piston by the biasing member and move the piston from the retracted position to an extended position.

2. An endeffector as defined in claim 1, further comprising a contact element positioned on an end of the piston for contacting a semiconductor wafer, the contact element having a flat surface.

3. An endeffector as defined in claim 1, further comprising a contact element positioned on an end of the piston for contacting a semiconductor wafer, the contact element having a convex-shaped surface.

4. An endeffector as defined in claim 1, wherein the piston is maintained in a bearing assembly positioned downstream from the pneumatic actuator, the bearing assembly preventing particles generated during movement of the piston from contacting a semiconductor wafer held on the base member.

5. An endeffector as defined in claim 1, wherein the biasing member comprises a spring.

6. An endeffector as defined in claim 1, wherein the force applied to the piston by the biasing member increases as the piston is extended.

7. An endeffector as defined in claim 1, wherein the pneumatic actuator is connected to a first gas line and a second gas line, the actuator

including a driving member, the first gas line being configured to feed a gas into the pneumatic actuator for moving the driving member out of the pneumatic actuator and the second gas line being configured to feed a gas into the pneumatic actuator for retracting the driving member, the driving member being connected to the piston.

8. An endeffector as defined in claim 1, further comprising a suction device positioned adjacent to the pneumatic actuator, the suction device being configured to create a suction force for capturing any particles that are released during movement of the piston.

9. An endeffector as defined in claim 1, further comprising at least one position sensor for sensing the position of the piston.

10. An endeffector as defined in claim 1, wherein the pushing device is positioned at the proximal end of the base member.

11. An endeffector as defined in claim 1, wherein the endeffector has a maximum profile height of less than about 12 millimeters.

12. An endeffector as defined in claim 1, wherein the endeffector has a maximum profile height of less than about 10 millimeters.

13. An endeffector as defined in claim 1, further comprising at least one backstop member located on the base member generally opposite the pushing device, wherein the backstop member has a height sufficient for a wafer to be held in between the backstop member and the piston when the piston is at least partially extended.

14. An endeffector as defined in claim 13, wherein the base member includes a first tine spaced from a second tine, the first and second tines terminating at the distal end of the base member, each of the tines including at least one backstop member.

15. An endeffector as defined in claim 1, wherein the biasing member and the pneumatic actuator are contained in a housing defined by the base member.

16. An endeffector as defined in claim 1, wherein at least certain of the support members comprise a surface configured to only contact an edge of a semiconductor wafer, the surface having a convex and eccentrical shape.

17. An endeffector as defined in claim 1, further comprising a wafer detection system comprising a light sending pathway positioned opposite a light receiving pathway across the base member, the light sending pathway being configured to emit a light beam towards the light receiver pathway, and wherein the wafer detection system is configured to detect the presence of a wafer when the light beam is intersected by the wafer.

18. An endeffector as defined in claim 1, wherein the plurality of support members define a wafer receiving area and wherein the endeffector further comprises a pair of emergency pins located across from each other on the base member generally in a center area of the wafer receiving area between the proximal end and the distal end of the base member, the emergency pins having a height that is below the height of the support members, the emergency pins for preventing a semiconductor wafer from contacting the base member.

19. An endeffector as defined in claim 14, wherein a pair of backstop members are positioned at the end of each tine, each pair of backstop members surrounding a corresponding support member, each backstop member having a height greater than the height of the corresponding support member.

20. An endeffector as defined in claim 1, wherein the plurality of support members define a wafer receiving area and wherein the endeffector further comprises at least one peripheral emergency member located at the proximal end of the base member outside of the wafer receiving area, the emergency member having a height greater than the height of the support members for maintaining a semiconductor wafer within the wafer receiving area.

21. An endeffector for handling semiconductor wafers comprising:

a base member having a proximal end and a distal end;

a plurality of support members located on the base member for contacting and supporting a semiconductor wafer placed on the endeffector, the plurality of support members defining a wafer receiving area therebetween;

a light sending pathway comprising a light source in communication with a light pipe and an angle optic device, wherein a light beam being emitted by the light source is transmitted by the light pipe to the angle optic device, the angle optic device being configured to redirect the light beam across the wafer receiving area;

a light receiver pathway positioned across the wafer receiving area opposite the light sending pathway for receiving a light beam being emitted by the light sending pathway; and

a light sensor in communication with the light receiver pathway, the light sensor being configured to indicate the presence of a wafer when the light beam being directed across the wafer receiving area is intersected.

22. An endeffector as defined in claim 21, wherein the light sending pathway further comprises an optic aperture positioned between the light pipe and the angle optic device.

23. An endeffector as defined in claim 22, wherein the aperture has a diameter that is less than the diameter of the light pipe.

24. An endeffector as defined in claim 23, wherein the light pipe has a diameter of from about 2 mm to about 6 mm and the aperture has a diameter of from about 0.2 mm to about 1 mm.

25. An endeffector as defined in claim 21, wherein the angle optic device comprises a reflecting device spaced from a convex lens, the convex lens being configured to focus and narrow a light beam.

26. An endeffector as defined in claim 21, wherein the light sending pathway is positioned opposite the light receiver pathway at the proximal end of the base member.

27. An endeffector as defined in claim 21, wherein the light pipe comprises a crystalline fiber.

28. An endeffector as defined in claim 21, wherein the light pipe comprises a quartz fiber.

29. An endeffector as defined in claim 21, wherein the light receiver pathway further comprises a light receiver opening positioned opposite the light sending pathway.

30. An endeffector as defined in claim 21, wherein the light receiver pathway also comprises an angle optic device in communication with a light pipe, the light pipe being in communication with the light sensor.

31. An endeffector as defined in claim 21, wherein the light sending pathway is configured to direct a light beam across the wafer receiving area having an average diameter of from about 2 mm to about 4 mm.

32. An endeffector as defined in claim 31, wherein the light beam has a slightly conical shape.

33. An endeffector for handling semiconductor wafers comprising:

a base member having a proximal end and a distal end;

a plurality of support members located on the base member for contacting and supporting a wafer placed on the endeffector; and

wherein the endeffector has a maximum profile height of less than about 12 mm.

34. An endeffector as defined in claim 33, wherein the endeffector has a maximum profile height of less than about 10 mm.

35. An endeffector as defined in claim 33, further comprising a pushing device located at the proximal end of the base member, the pushing device comprising a retractable piston configured to contact an edge of a semiconductor wafer for positioning the wafer on the base member.

36. An endeffector as defined in claim 35, wherein the endeffector has a maximum profile height of less than about 10 mm.

37. An endeffector as defined in claim 33, wherein the plurality of support members are shaped so as to only contact a semiconductor wafer about its edge.

38. An endeffector as defined in claim 33, wherein at least certain of the support members comprise a surface configured to only contact an edge of a semiconductor wafer, the surface having a convex and eccentrical shape.

39. An endeffector as defined in claim 38, wherein the base member includes a first tine spaced from a second tine in a forked arrangement, the first and second tines terminating at the distal end of the base member, the support members having a convex and eccentrical surface being positioned at the distal end of each of the tines.

40. An endeffector as defined in claim 39, further comprising backstop members surrounding the support members located on the first tine and the second tine at the distal end of the base member, the backstop members having a height greater than the support members.

41. An endeffector as defined in claim 33, wherein the plurality of support members define a wafer receiving area and wherein the endeffector

further comprises a pair of emergency pins located across from each other on the base member generally in a center area of the wafer receiving area between the proximal end and the distal end of the base member, the emergency pins having a height that is below the height of the support members, the emergency pins for preventing a semiconductor wafer from contacting the base member.

42. An endeffector as defined in claim 35, wherein the piston of the pushing device is in operative association with a pneumatic actuator, the pneumatic actuator being configured to receive a pressurized gas that is used to move the piston from a retracted position to an extended position.

43. An endeffector as defined in claim 42, further comprising a suction device positioned adjacent to the pneumatic actuator, the suction device being configured to create a suction force for capturing any particles that are released during movement of the piston.

44. An endeffector as defined in claim 33, further comprising a wafer detection system comprising a light sending pathway positioned opposite a light receiving pathway across the base member, the light sending pathway being configured to emit a light beam towards the light receiving pathway, and wherein the wafer detection system is configured to detect the presence of a wafer when the light beam is intersected by the wafer.

45. An endeffector as defined in claim 33, wherein the support members are made from a material comprising polyether-ether ketone or polyoxymethylene acetal polymer.

46. An endeffector as defined in claim 45, wherein the base member is made from a material comprising a metal.

47. An endeffector for handling semiconductor wafers comprising:

a base member having a proximal end and a distal end;

a plurality of support members located on the base member for contacting and supporting a wafer placed on the endeffector, the base member including at least four support members defining a wafer receiving area therebetween, wherein at least one of the support members includes a sloping surface having an eccentrical and convex shape, the sloping surface being configured to only contact a semiconductor wafer along an edge of the wafer.

48. An endeffector as defined in claim 47, wherein the base member includes a first tine spaced from a second tine, each of the tines including a terminal end defining the distal end of the base member, and wherein a support member is located at the terminal end of each of the tines, each of the support members including the sloped surface having an eccentrical and convex shape.

49. An endeffector as defined in claim 48, further comprising backstop members surrounding each of the support members located at the terminal end of each of the tines.

50. An endeffector as defined in claim 47, further comprising a pushing device located at the proximal end of the base member, the pushing device comprising a retractable piston configured to contact an edge of a semiconductor wafer for positioning the wafer on the base member.

51. An endeffector as defined in claim 50, wherein the endeffector has a maximum profile height of less than about 12 mm.

52. An endeffector as defined in claim 50, wherein the endeffector has a maximum profile height of less than about 10 mm.

53. An endeffector as defined in claim 47, wherein the plurality of support members are shaped so as to only contact a semiconductor wafer about its edge.

54. An endeffector as defined in claim 47, wherein the plurality of support members define a wafer receiving area and wherein the endeffector further comprises a pair of emergency pins located across from each other on the base member generally in a center area of the wafer receiving area between the proximal end and the distal end of the base member, the emergency pins having a height that is below the height of the support members, the emergency pins for preventing a semiconductor wafer from contacting the base member.

55. An endeffector as defined in claim 50, wherein the piston of the pushing device is in operative association with a pneumatic actuator, the pneumatic actuator being configured to receive a pressurized gas that is used to move the piston from a retracted position to an extended position.

56. An endeffector as defined in claim 55, further comprising a suction device positioned adjacent to the pneumatic actuator, the suction device being configured to create a suction force for capturing any particles that are released

during movement of the piston.

57. An endeffector as defined in claim 47, further comprising a wafer detection system comprising a light sending pathway positioned opposite a light receiving pathway across the base member, the light sending pathway being configured to emit a light beam towards the light receiving pathway, and wherein the wafer detection system is configured to detect the presence of a wafer when the light beam is intersected by the wafer.

58. An endeffector as defined in claim 47, wherein the support members are made from a material comprising polyether-ether ketone or polyoxymethylene acetal polymer.

59. An endeffector as defined in claim 58, wherein the base member is made from a material comprising a metal.

60. An endeffector for handling semiconductor wafers comprising:

a base member having a proximal end and a distal end;

a plurality of support members located on the base member for contacting and supporting a wafer placed on the endeffector, the support members defining a wafer receiving area therebetween; and

a plurality of emergency pins located on the base member in a center area located between the proximal end and the distal end of the base member, each of the emergency pins having a height less than a height defined by the support members, the emergency pins being located on the base member so as to prevent a semiconductor wafer supported on the support members from contacting other portions of the base member.

61. An endeffector as defined in claim 60, wherein the emergency pins have a height and are placed at a location such that the emergency pins only contact a semiconductor wafer held on the support members when the semiconductor wafer is bowing.

62. An endeffector as defined in claim 60, wherein the emergency pins have a height less than about 1 mm.

63. An endeffector as defined in claim 60, wherein the endeffector includes two emergency pins spaced across from each other in the center area on the base member within the wafer receiving area.

64. An endeffector as defined in claim 63, wherein the base member includes a first tine spaced from a second tine, each of the tines including a terminal end defining the distal end of the base member, and wherein each emergency pin is located on a corresponding tine.

65. An endeffector as defined in claim 60, wherein the base member is made from a material comprising a metal.

66. An endeffector as defined in claim 60, wherein the base member is made from a material comprising quartz.

67. An endeffector as defined in claim 65, wherein the support members and the emergency pins are made from a crystalline material.

68. An endeffector as defined in claim 67, wherein the crystalline material comprises quartz.

69. An endeffector as defined in claim 60, wherein at least one of the support members defines a sloping surface having a convex and eccentrical shape, the sloping surface being configured only to contact an edge of a semiconductor wafer.

70. An endeffector as defined in claim 60, wherein the support members are configured to only contact an edge of a semiconductor wafer.

71. An endeffector as defined in claim 60, further comprising a pushing device located at the proximal end of the base member, the pushing device comprising a retractable piston configured to contact an edge of a semiconductor wafer for positioning the wafer on the base member.

72. An endeffector as defined in claim 60, wherein the endeffector has a maximum profile height of less than about 12 mm.

73. An endeffector as defined in claim 60, wherein the endeffector has a maximum profile height of less than about 10 mm.

74. An endeffector as defined in claim 71, wherein the piston of the pushing device is in operative association with a pneumatic actuator, the pneumatic actuator being configured to receive a pressurized gas that is used to move the piston from a retracted position to an extended position.

75. An endeffector as defined in claim 74, further comprising a suction device positioned adjacent to the pneumatic actuator, the suction device being configured to create a suction force for capturing any particles that are released

during movement of the piston.

76. An endeffector as defined in claim 60, further comprising a wafer detection system comprising a light sending pathway positioned opposite a light receiving pathway across the base member, the light sending pathway being configured to emit a light beam towards the light receiving pathway, and wherein the wafer detection system is configured to detect the presence of a wafer when the light beam is intersected by the wafer.

77. An endeffector as defined in claim 60, wherein the support members have an arcuate shape that generally matches a radius of a semiconductor wafer, each support member having a wafer contact surface that tapers from a maximum radius to a minimum radius adjacent the base member, the difference between the maximum radius and the minimum radius being at least about 0.75 mm, the support members only contacting a semiconductor wafer along an edge thereof.

78. An endeffector as defined in claim 77, wherein the support members are made from a material capable of withstanding temperatures of up to at least about 750°C.

79. An endeffector as defined in claim 77, wherein the base member including the support members and the emergency pins are made from a crystalline material.

80. An endeffector as defined in claim 79, wherein the support members and the emergency pins are integral with the base member.

81. An endeffector as defined in claim 79, wherein the crystalline material comprises quartz.

82. An endeffector as defined in claim 80, wherein the quartz is flame polished.

83. An endeffector as defined in claim 77, wherein the wafer contact surfaces of the support members have a convex shape.

84. An endeffector as defined in claim 77, wherein the wafer contact surfaces of the support members have a concave shape.

85. An endeffector as defined in claim 77, wherein the wafer contact surfaces of the support members are chamfered.

86. An endeffector for handling semiconductor wafers comprising:

a base member having a proximal end and a distal end;

a plurality of support members located on the base member for contacting and supporting a wafer placed on the endeffector, the support members being configured to only contact an edge of a semiconductor wafer, the support members defining a wafer receiving area therebetween, the support members having an arcuate shape that generally matches a radius of a semiconductor wafer, each support member having a wafer contact surface that tapers from a maximum radius to a minimum radius adjacent the base member, the difference between the maximum radius and the minimum radius being at least about 0.75 mm.

87. An endeffector as defined in claim 86, wherein the support members are made from a material capable of withstanding temperatures of up to at least about 750°C.

88. An endeffector as defined in claim 86, wherein the base member including the support members and the emergency pins are made from a crystalline material.

89. An endeffector as defined in claim 88, wherein the support members and the emergency pins are integral with the base member.

90. An endeffector as defined in claim 88, wherein the crystalline material comprises quartz.

91. An endeffector as defined in claim 90, wherein the quartz is flame polished.

92. An endeffector as defined in claim 86, wherein the wafer contact surfaces of the support members have a convex shape.

93. An endeffector as defined in claim 86, wherein the wafer contact surfaces of the support members have a concave shape.

94. An endeffector as defined in claim 86, wherein the wafer contact surfaces of the support members are chamfered.

95. An endeffector as defined in claim 86, wherein the endeffector has a maximum profile height of less than about 12 mm.

96. An endeffector as defined in claim 86, wherein the endeffector has a maximum profile height of less than about 10 mm.

97. An endeffector as defined in claim 86, wherein the base member includes a first tine spaced from a second tine, each of the tines including a terminal end defining the distal end of the base member, and wherein a support member is located at the terminal end of each of the tines.

98. An endeffector as defined in claim 97, wherein the endeffector includes at least four support members.

99. An endeffector as defined in claim 98, wherein the endeffector includes at least two support members positioned at the proximal end of the base member.

100. An endeffector as defined in claim 86, wherein the plurality of support members define a wafer receiving area and wherein the endeffector further comprises a pair of emergency pins located across from each other on the base member generally in a center area of the wafer receiving area between the proximal end and the distal end of the base member, the emergency pins having a height that is below the height of the support members, the emergency pins for preventing a semiconductor wafer from contacting the base member.